Kentucky Schools Going Solar Guidelines and Application

The Kentucky Schools Going Solar project is a unique opportunity for Kentucky Schools to combine education with a photovoltaic system installation and demonstration.

Application due date: April 15, 2003

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Section 1: Project Summary

The Kentucky Division of Energy, American Electric Power, The National Energy Education Development Project Kentucky affiliate (Kentucky NEED) and The Foundation for Environmental Education are partnering to install photovoltaic (PV) systems at ten schools across Kentucky in order to stimulate the creation of a community of solar schools within the Commonwealth. The PV systems will meet the requirements for certification by the U.S. Department of Energy (USDOE) in accordance with its Million Solar Roofs and EnergySmart Schools programs. Schools electing to incorporate new solar energy generation into their energy mix will also receive training to include units of study about solar energy in their classroom curricula.

Who is Eligible to Apply

All Kentucky schools (public, private and parochial) are eligible to apply. Interested schools must complete the enclosed application and submit it to Karen Reagor at Kentucky NEED by close of business on April 15, 2003. Please read this entire application packet carefully to ensure that you fully understand the obligations of your school should it be chosen to participate.

Selection Process

An evaluation team will review all applications. The team will strive to select at least one school from each of the eight Kentucky Department of Education regions. Schools selected to participate will be notified when the evaluation team has conducted a complete review of the applications and determined that all criteria are met. The decisions of the evaluation team are final.

Educational Benefits

To maximize the educational benefits of this project, a solar energy curriculum will be provided to each participating school. Each school will agree to integrate this curriculum in its curriculum as a condition of participation. This curriculum will be provided by the National Energy Education Development Project and will include a variety of materials, lessons and hands-on activities focusing on solar energy.

In addition, the installed PV systems will include a performance-monitoring system that will allow students to monitor the production of electricity from the system. We hope to make this information accessible through an Internet website.

Community Outreach

Schools selected to participate will agree to host a *Solar Celebration* within three months of installation to educate the broader community about how the system works. The *Solar Celebration* is to be publicized in local media, as well as posted on appropriate Internet websites.

Project Financing

The basic cost of the PV systems will be funded by this project. Schools selected must commit to a minimum base charge of $1,500.00. The base charge includes an initial site visit and consultation by an experienced PV system installer, delivery of materials to the schools, and telephone/e-mail ongoing consultation for both the locally installed and turnkey level projects. Turnkey installation, including all labor and miscellaneous hardware is estimated at $3,500.00 (on top of the base charge of $1,500.00). The installation labor and materials will be determined on an individual school system basis, factoring in degree of difficulty, location, and the local contribution of labor and materials. A turnkey price of $3,500.00 is considered an upper end price that should cover most situations. The cost of the installation can be reduced if a school system can secure "in-kind" voluntary labor and material donations.

By accepting ownership of the system, the school will receive the full warranty provided by the system supplier/installer.

There will be no additional funding available from the project partners after the system is installed and operational.

Project Partners

The Kentucky Division of Energy
American Electric Power
The National Energy Education Development Project, Kentucky affiliate
The Foundation for Environmental Education

What is Solar Electric Energy?

Solar energy is, simply, energy from the sun. The amount of energy from sunlight that falls on the earth each day is enormous. On an average day, a square meter on Earth collects an average of about 4.2 kilowatt-hours of energy. This figure varies by location and weather patterns. Deserts receive the most sun, more than 6 kilowatt-hours per day per square meter. Northern climates receive closer to 3.6 kilowatt-hours.

Photovoltaic systems convert this sunlight directly into electricity. According to the U.S. Department of Energy's Photovoltaics Program, "PV modules covering 0.3 percent of the land in the United States could supply all the electricity consumed here."

The word 'photo' means light, and 'voltaic' refers to the electrochemical process of producing electricity. When sunlight strikes a PV cell, it is changed directly into electricity without creating any air or water pollution. PV cells are made of at least two layers of semiconductor material. One layer has a positive charge, and the other has a negative charge. When light enters the cell, some of the photons from the light are absorbed by the semiconductor's atoms, freeing electrons from the cells' negative layer to flow through an external circuit and back into the positive layer. This flow of electrons produces an electric current.

Benefits of Photovoltaic Systems

Photovoltaics has proven itself over the past 20 years as an effective, quiet, reliable, and increasingly economical approach to generating pollution-free energy and reducing greenhouse gas emissions. In addition, PV systems have low operating costs, since their fuel (sunlight) is free and there are few, if any moving parts.

Solar energy, because of its decentralized and easily distributed nature, is ideal for certain residential and commercial applications. Solar energy, for example, is well-suited to provide a portion of most homes' energy needs. Solar systems equipped by battery backup have been found to be extremely valuable in responding to the power needs of communities that have experienced hurricanes and other natural disasters. In the construction of new homes and commercial structures, "building integrated" PV systems are successfully being designed right into the façade and/or roof of these new buildings.

Today, more than 2 billion people in the world do not have electricity. Extending the utility grid to these areas is very expensive. Thus, in an increasing number of cases, solar energy is being tapped to provide less-expensive electricity to people in rural communities. Several studies in the U.S. and elsewhere have cited the economic and health benefits the public can derive from the installation of PV systems.

Photovoltaics are used to generate power for a wide variety of applications, including pocket calculators, water pumping, emergency power, sophisticated telecommunications equipment, street lighting, space satellites, lighthouses, and residential and commercial electricity.

How a Utility-Intertied Photovoltaic System Works

A utility-intertied—sometimes called grid-connected—PV system generates electricity that is supplemented by the energy provided by the existing utility grid. A utility-intertied PV system requires neither battery storage nor an emergency back-up system since it is connected directly to the utility grid, which is used as the storage medium. While a PV system can be designed to provide all of a building's electrical needs, most systems provide only a portion of the total electricity requirements. The systems to be installed under this project will provide only a small portion of the school's total electricity needs.

Since PV modules are only capable of producing direct current (DC) electricity, an inverter is required to convert the DC output produced by the PV array into alternating current (AC) power. AC electricity is needed to run computers, refrigerators and other appliances, and lighting. Utility interactive inverters have built-in safety features that prevent them from operating if there is an interruption in grid-supplied power. The inverter uses the prevailing line-voltage frequency of the utility line as a control meter to ensure that the PV system's output is fully synchronized with the utility power.

The basic building block of a PV panel is the PV cell, which is a solid state, or non-mechanical, device. A solar system uses a number of PV panels, each made of silicon, plus boron and phosphorous. The output of a single cell under direct sunlight is about one watt. To increase their effectiveness, dozens of individual cells are interconnected together in a sealed, weatherproof glass package called a module. Modules come in a range of wattages, and their nature allows for great flexibility in designing systems that meet a variety of electrical needs.

Durability of Solar Systems

Solar panels are protected by rugged tempered glass and will withstand nearly any natural occurrence of rain, snow, hail, or wind. When the panels are covered with snow, bright sunlight penetrates the snow and melts it from underneath.

Why Are Schools a Good Choice for Solar Energy Demonstrations?

As natural centers of community activity, schools provide an excellent opportunity for students and the broader community to become more familiar with energy issues in general and solar energy technologies in particular. Solar energy system demonstrations, combined with an effective solar energy curriculum, can:

- provide a valuable learning experience for students and community residents;
- increase awareness about the benefits of solar energy;
- help protect our environment;
- save money for the schools by allowing them to generate their own electricity from renewable energy resources; and
- help overcome current market barriers that prevent renewable energy systems from being more widely used.

More than 20 states across the country have a solar schools program in place and are realizing these benefits for their schools, the community, the economy, and the environment.

Design of PV Systems for the *Kentucky Schools Going Solar* Project

The PV system installed under *Kentucky Schools Going Solar* will include the following components:

- PV modules (Siemens Sm-50)
- Major Ancillary Components
- Grid tied inverter (Advanced Energy GC-1000), with string combiner, AC disconnect and lightning arrestor or equivalent
- Advanced Energy Remote monitor or equivalent for PV System electrical data posting to a web site
- Custom rack for solar panel modules

The specifics of these components will be determined once an equipment supplier/installer is selected.

System Output

The 1-kw PV system will produce about 1000 watts of electricity, on a clear day. Output for each system could vary somewhat according to specific site variables, local weather patterns, and other factors.

Section II: *Kentucky Schools Going Solar* Application Guidelines

Selection/Eligibility Criteria

Any school (public, private or parochial) in the Commonwealth of Kentucky is eligible to apply. Awards will be granted to schools that both meet all eligibility requirements and commit to an outreach effort to educate both students and the community as a whole about the applications and benefits of solar energy, and that also meet physical site requirements.

Schools wishing to apply must:

- Complete the enclosed application.
- Submit a Written Narrative/Action Plan. The Written Narrative/Action Plan must be no more than 500 words and must accompany the application. It should specifically address the issues listed below.

A goal of this project is to ensure that the solar installations become an important and on-going part of each school's activities. Thus, applicants will be judged heavily by their plans for education and outreach. As part of your Plan of Action, note how your school will promote the installation to the community, involve students, create interactive activities, and interact with the broader community about renewable energy issues. Describe the outreach efforts your school will undertake to educate its students and the community as a whole about the benefits of solar energy.

Some possible outreach activities include:

- developing new educational activities to integrate into existing curricula
- developing a student committee to work with the city council or other governing body to pass a local solar ordinance.
- holding an annual energy fair to educate the community about solar and other renewable energy systems
- publishing articles in local newspapers about solar energy

Preference will be given to those schools that present a coherent and imaginative set of hands-on activities and objectives that involve a broad cross-section of teachers, students, and administrators committed to making the installation one of the school's cornerstone learning experiences.

When articulating your Plan of Action, describe the following points:

- Identify a Solar Program Coordinator and the specific steps he or she will take to ensure that the entire school is made aware of the PV system. Provide a preliminary list of teachers in your school who will be part of this project and what specific contributions each will make toward educating the school about solar energy.

- Describe how the school will link with the local community and businesses through, for example, school-to-work programs, outside speakers, etc., to build awareness of the particular installation and solar energy in general.

- The school must be willing to hold a community *Solar Celebration* within three months of the installation, so that the general community can learn how the system works. Explain your plans for these public-outreach events.

Kentucky NEED
Kentucky Schools Going Solar

Application

Please return this application to: Karen P. Reagor
Kentucky NEED Project
P.O. Box 176055 OR 2717 Hurstland Court
Covington, KY 41017 Crestview Hills, KY 41017

DUE DATE: The completed application <u>must</u> be received by the close of business on April 15, 2003.

1. Name of School _____

   Address _____

   _____

   Phone(_____)_____Fax(_____)_____

   District_____ County_____

2. Designated Project Contact Person_____

   Title_____

   Phone _____Fax_____

   E-mail_____

3. Additional Information
   Grades taught at this school_____

   Number of students attending this school_____

   Number of students in this school district_____

   What is this school building's average cost of electricity per month?

   _____

4. If you are NOT selected as one of the eight (8) PV system recipients, are you interested in being a solar partner with one of the selected schools?

   _____Yes _____No

5. Suggested location for the PV array. Take into consideration visibility and student access and the absence of shading during most of the day.

_____

_____

6. Does the building's electrical system meet the current electric code?_____

7. Action Plan

   Describe in 500 words or less your Action Plan for successful integration of the PV system into the physical and educational components of your school/district. (Refer to "Action Plan" in the Guidelines for more complete details.)

8. Letter of Commitment

   Attach a letter of commitment signed by the appropriate school official. Your specific school district policy will dictate who has the authority to approve this project. This letter is intended as a demonstration of the school's commitment to the project. A final binding agreement will be signed prior to installation.

9. Schools selected to participate in Kentucky's Schools Going Solar project must agree to fulfill the following obligations:

   1. Must commit to cover all costs of installation of the PV panel in addition to the initial $1500 base charge. (See Project Financing on page 3.)
   2. Accept full ownership of the pre-selected hardware components (as outlined in the Program Description portion of this packet) that comprise the PV system.
   3. Maintain full legal and financial responsibility for the system once installed.
   4. Implement the solar energy curriculum provided by NEED in its classrooms.
   5. Commit to an education/outreach effort that will promote solar energy within the school and community.
   6. Designate an individual/team that will 'champion' the project.
   7. Gain approval for project participation by the school's decision – maker(s).
   8. Host a *Solar Celebration* within 3 months of installation to educate the general community about how the system works and how it will be used in the education process.

LIMITATION OF LIABILITY

In exchange for participation in the Kentucky Schools Going Solar Project (the "Project"), the _____ (the "School") hereby expressly assumes responsibility for its use, misuse, or inability to use the photovoltaic system provided hereunder. In no event shall American Electric Power, Inc., the Kentucky Division of Energy, the National Energy Education Development Project, nor its affiliate, the Foundation for Environmental Education (the "Sponsors") have any liability for damages, including, but not limited to any indirect, incidental, or consequential damages arising from or in connection with the School's participation in the Program.

Additionally, **TO THE EXTENT PERMITTED BY LAW, THE SCHOOL HEREBY AGREES TO INDEMNIFY, DEFEND AT ITS EXPENSE, AND SAVE AMERICAN ELECTRIC POWER, INC., THE KENTUCKY DIVISION OF ENERGY, THE NATIONAL ENERGY EDUCATION DEVELOPMENT PROJECT, AND THE FOUNDATION FOR ENVIRONMENTAL EDUCATION HARMLESS, FROM ANY LIABILITIES, COSTS AND CLAIMS, INCLUDING JUDGMENTS RENDERED AGAINST, AND FINES AND PENALTIES IMPOSED UPON, ANY OF THE SPONSORS ABOVE AND REASONABLE ATTORNEYS' FEES AND ALL OTHER COSTS OF LITIGATION, ARISING OUT OF THIS PROJECT, INCLUDING INJURIES, DISEASE OR DEATH TO PERSONS, OR DAMAGE TO PROPERTY, IN ANY WAY ATTRIBUTABLE TO THE PROJECT, EXCEPT THAT THE SCHOOL'S OBLIGATION TO INDEMNIFY A SPONSOR SHALL NOT APPLY TO ANY LIABILITIES TO THE EXTENT CAUSED BY THAT SPONSOR'S RECKLESSNESS OR WILLFUL MISCOUNDUCT.**

_____
Signed

_____
Title

_____
Date

Final Application Checklist

? ***Enclosed***
- ? Completed application form
- ? Action Plan
- ? Letter of commitment, signed by person authorized to approve the schools participation in this project.

? ***Read and approved*** your school's obligations should you be selected to participate in this project.

_____
Signed

_____
Title

_____
Date